

AMENDMENTS TO THE CLAIMS

This Listing of Claims will replace all prior versions, and listings, of claims in this application:

Listing of Claims:

1. (Currently Amended) A device for conducting processing steps on a substrate comprising an array of chemical compounds on a surface thereof, said device comprising:

a substrate comprising an array of chemical compounds on a surface thereof,

(a) a housing comprising a housing chamber configured to retain ~~any~~ fluid introduced into said housing chamber, said fluid having a meniscus,

a fluid retained in said housing chamber and having a meniscus at an interface of said fluid with an atmosphere and said substrate,

(b)—an opening in said housing adapted for insertion into said housing chamber of a substrate having a surface comprising an array of chemical compounds,

(c)—a fluid separation mechanism configured to separate fluid in said housing chamber from contact with said substrate, and

a computer controlling said device to cause said fluid separation mechanism to separate fluid in said housing chamber from contact with said substrate in a controlled manner that preserves the integrity of said fluid's meniscus at the atmosphere-fluid said interface by causing surface tension of said fluid in conjunction with a level of hydrophobicity or hydrophilicity of said surface of said substrate to limit formation of

isolated droplets of said fluid separate from a major mass of said fluid in said housing chamber;

~~(d) at least one inlet in fluid communication with said housing chamber, and~~

~~(e) at least one outlet in fluid communication with said housing chamber.~~

2. (Original) A device according to claim 1 further comprising a tilt mechanism for controlling the orientation of said device.

3. (Currently Amended) A device according to claim 1 wherein said fluid separation mechanism is a lifting mechanism for lifting said substrate out of contact with said fluid, said computer controlling said lifting mechanism to lift said substrate out of contact with said fluid in said controlled manner.

4. (Canceled)

5. (Currently Amended) A device according to claim 1 wherein said fluid separation mechanism is a fluid removal mechanism for removing fluid from said housing chamber, said computer controlling said fluid removal mechanism to remove fluid from said housing chamber in said controlled manner.

6-7. (Canceled)

8. (Original) A device according to claim 5 wherein said fluid removal mechanism comprises a valve or a pump.

9. (Currently Amended) A device for conducting processing steps on a substrate comprising an array of chemical compounds on a surface thereof, said device comprising:

(a) a housing comprising a housing chamber configured to retain any fluid introduced into said housing chamber, said fluid having a meniscus,

(b) an opening in said housing adapted for insertion into said housing chamber of a substrate having a surface comprising an array of chemical compounds,

(c) a fluid separation mechanism configured to separate fluid in said housing chamber from contact with said substrate in a controlled manner that preserves the integrity of the fluid meniscus at the atmosphere-fluid interface, wherein said fluid separation mechanism is a fluid removal mechanism for removing fluid from said housing chamber in said controlled manner,

~~A device according to claim 8 wherein said fluid removal mechanism~~ comprising
~~comprises~~ a valve having a varying cross-section relative to height of fluid in said housing chamber,

(d) at least one inlet in fluid communication with said housing chamber, and

(e) at least one outlet in fluid communication with said housing chamber.

10. (Original) A device according to claim 8 wherein said fluid removal

mechanism comprises a pump having a constant displacement.

11. (Original) A device according to claim 1 further comprising a temperature controller.

12 (Canceled)

13. (Currently Amended) A device according to claim 2 48 ~~wherein said separator comprises~~ further comprising a pair of flexible members adjacent said having a wedge member ~~therebetween~~.

14. (Original) A device according to claim 1 further comprising a means for cooling a fluid.

15. (Original) A device according to claim 1 further comprising a heat exchanger for heating and/or cooling a fluid.

16. (Original) A device according to claim 1 further comprising a solvent vapor generator.

17. (Canceled)

18. (Currently Amended) A device according to claim 17 1 wherein said chemical array is a biopolymer array.

19-28. (Canceled).

29. (Currently Amended) A method for performing a step of a hybridization reaction on the surface of a substrate, said method comprising:

(a) inserting a substrate comprising an array of chemical compounds on a surface thereof into a housing chamber of a device ~~according to claim 1~~ for conducting processing, the device comprising a housing comprising a housing chamber configured to retain fluid, and an opening in said housing adapted for insertion into the housing chamber of the substrate, and

(b) introducing a fluid reagent for performing said step into said housing chamber, and

(c) removing said fluid reagent from contact with said substrate in a controlled manner causing surface tension of said fluid in conjunction with a level of hydrophobicity or hydrophilicity of said surface of said substrate to limit formation of isolated droplets of said fluid separate from a major mass of said fluid in said housing chamber at a rate that substantially eliminates formation of droplets of said fluid on said surface of said substrate.

30. (Currently Amended) A method according to claim 29 wherein said step is

washing said surface and/or drying of said surface.

31. (Currently Amended) A method according to claim 29 wherein said removing is carried out by lifting said substrate from said housing ~~in said controlled manner~~.

32. (Original) A method according to claim 29 wherein said removing is carried out by a removal mechanism selected from the group consisting of (i) a valve having a varying cross-section relative to height of fluid in said housing chamber and (ii) a pump having a constant displacement.

33. (Currently Amended) A method for performing a step of a hybridization reaction on the surface of a substrate, said method comprising:

(a) inserting a substrate comprising an array of chemical compounds on a surface thereof into a housing chamber of a device comprising:

a housing comprising a housing chamber configured to retain fluid introduced into said housing chamber, said fluid having a meniscus,

an opening in said housing adapted for insertion into said housing chamber of a substrate having a surface comprising an array of chemical compounds,

a fluid separation mechanism configured to separate fluid in said housing chamber from contact with said substrate in a controlled manner that preserves the integrity of the fluid meniscus at the atmosphere-fluid interface,

at least one inlet in fluid communication with said housing chamber, and

_____ at least one outlet in fluid communication with said housing chamber,

(b) _____ introducing a fluid reagent for performing said step into said housing chamber,

_____ (c) _____ removing said fluid reagent from contact with said substrate in a controlled manner at a rate that substantially eliminates formation of droplets of said fluid on said surface of said substrate, and

~~A method according to claim 29 further comprising~~

(d) _____ introducing a fluid vapor into said housing chamber during said removing to assist in drying said substrate surface.

34. (Original) A method according to claim 33 wherein said fluid vapor is a vapor of an organic solvent.

35. (Original) A method according to claim 29 further comprising tilting said device during said removing.

36. (Currently Amended) A method according to claim 29 wherein said substrate is part of a sealed hybridization chamber and said method comprises disassembly of said hybridization chamber in the presence of disassembly buffer.

37. (Currently Amended) An apparatus for conducting a processing step of a hybridization reaction involving an array of biopolymers on the surface of a substrate,

said apparatus comprising:

- (a) one or more devices according to claim 1-3,
- (b) one or more fluid reagent reservoirs in fluid communication with one or more of said devices,
- (c) a tilt mechanism for controlling the orientation of each of said devices,
- (d) one or more pumps for controlling the flow of fluid reagents into each of said devices, and
- (e) at least one heat exchanger for controlling the temperature of said fluid reagents, and
- (f) ~~—a portion of~~ said a lifting mechanism being external to said devices
~~wherein said lifting mechanism lifts said substrate out of contact with a fluid reagent in a controlled manner that preserves the integrity of the fluid reagent's meniscus at the atmosphere fluid interface.~~

38. (Original) An apparatus according to claim 37 further comprising a transfer mechanism for moving a substrate to and from said devices.

39. (Original) An apparatus according to claim 37 further comprising a thermally insulating member around at least a portion of each of said devices.

40. (Original) A method for analyzing a liquid sample, said method comprising contacting said liquid sample with a surface of a substrate comprising a plurality of

chemical compounds and processing said surface in an apparatus according to claim 37.

41. (Original) A method according to claim 40 further comprising exposing the array to a sample and reading the array.

42. (Original) A method comprising forwarding data representing a result obtained from a reading of an array exposed according to the method of claim 41.

43. (Original) A method according to claim 42 wherein the data is transmitted to a remote location.

44. (Original) A method comprising receiving data representing a result of an interrogation obtained by reading of an array exposed according to the method of claim 41.

45. (Canceled)

46. (Currently Amended) A flow device comprising:

(a) a reaction chamber having an opening for insertion of a substrate into said reaction chamber, said substrate having a cover slide over a surface thereof wherein said surface comprises a plurality of biopolymers, and

(b) a separator mechanism for separating said substrate surface from said

cover slide while in said reaction chamber without damage to said biopolymers on said surface.

~~A flow device according to claim 45 wherein said separator mechanism comprises~~
comprising a pair of flexible members having a wedge member therebetween and
disposed to insert between and separate said substrate surface from said cover slide.

47. (Currently Amended) A device for conducting processing steps on a
substrate comprising an array of chemical compounds on a surface thereof, said device
comprising:

a housing comprising a housing chamber configured to retain a fluid,
an opening in said housing adapted for insertion of a substrate having a
surface comprising an array of chemical compounds into said housing chamber,

a fluid separation means for separating fluid from contact with said
substrate in a controlled manner so that preserves the integrity of the fluid's meniscus at
~~the atmosphere fluid interface is preserved,~~ by causing surface tension of the fluid in
conjunction with a level of hydrophobicity or hydrophilicity of the surface of the substrate
to limit formation of isolated droplets of said fluid separate from a major mass of said
fluid in said housing chamber,

~~at least one inlet in fluid communication with said housing chamber, and~~
~~at least one outlet in fluid communication with said housing chamber.~~

a computer controlling said fluid separation means to separate fluid in said
housing chamber from contact with said substrate in said controlled manner.

48. (Currently Amended) The device of claim 42 1, further comprising a wedge wherein said separator mechanism is configured to positioned to insert between and separate a sandwich of said substrate and from said a cover slide positioned in said housing chamber to expose said surface of said substrate to fluid within said housing chamber.

49. (Currently Amended) The flow device of claim 45 46, wherein said separator mechanism is configured to separate said substrate from said cover slide to expose said plurality of biopolymers to fluid within said housing chamber.

50. (Previously Presented) The flow device of claim 46, wherein said wedge member is positioned to separate said substrate from said cover slide to expose said plurality of biopolymers to fluid within said housing chamber.

51. (Currently Amended) The device of claim 42 1, further comprising a wedge wherein said separator mechanism is configured to positioned to insert between and part a sandwich of said substrate and from said a cover slide positioned in said housing chamber to expose said surface of said substrate to fluid within said housing chamber.

52. (Currently Amended) The flow device of claim 45 46, wherein said separator mechanism is configured to part said substrate from said cover slide to expose said plurality of biopolymers to fluid within said housing chamber.

53. (Previously Presented) The flow device of claim 46, wherein said wedge member is positioned to part said substrate from said cover slide to expose said plurality of biopolymers to fluid within said housing chamber.

54. (Currently Amended) The device of claim 1, wherein said computer controls said fluid separation mechanism to ~~controlled manner~~ provides for a constant velocity of flow of fluid reagent during its removal from the housing chamber.

55. (Currently Amended) The device of claim 1, wherein said computer controls said fluid separation mechanism to ~~controlled manner~~ provides for a constant velocity of flow of fluid reagent during its removal from the housing chamber, as measured by a velocity of movement of the fluid-reagent's meniscus.